Author compliments

ON THE OCCURRENCE OF *PHACIDIELLA DISCOLOR* (MOUT. & SACC.) POTEBNIA IN ENGLAND

BY

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ON THE OCCURRENCE OF PHACIDIELLA DISCOLOR (MOUT. & SACC.) POTEBNIA IN ENGLAND.

(With 4 Text-figures.)

By F. T. Brooks.

On the publication of the paper "Notes on a pycnidial fungus associated with a dying-back of apple branches" by Southee and Brooks (1), Miss E. M. Wakefield and Mr W. C. Moore called my attention to a paper by Potebnia (2). Struck by the similarity between the fungus described by Southee and Brooks and that described by Potebnia they suggested that the same organism was perhaps under consideration in both papers. On reading Potebnia's paper it became clear to me that the pycnidial fungus of Southee and Brooks was probably identical with the *Phacidiella discolor* of Potebnia. Experiments were at once commenced to settle the matter.

At about the same time the following cultures were handed over to me for comparative study:

(1) From Dr G. H. Pethybridge a pycnidial fungus (identified as *Fuckelia conspicua* E. & E. Marchal) isolated by Dr R. M. Nattrass from a canker of apple trees in Herefordshire.

(2) From Miss E. M. Wakefield *F. conspicua* E. & E. Marchal from the collection of fungus cultures, Baarn, Holland.

(3) From Miss E. M. Wakefield a sterile culture of *Ph. discolor* (Mout. & Sacc.) Potebnia, originally obtained from Baarn. In spite of all efforts it was impossible to get this fungus to produce spores, so it will not be considered further.

(4) From Miss L. Solberg a culture of "*Pyrenochaeta furfuracea* (Fries) Rostrup" isolated in Norway from a stored apple affected by a black rot. Miss Solberg having previously seen the writer's cultures considered that they were essentially identical with "*Py. furfuracea*," with which she was familiar in Norway.

With regard to *F. conspicua* Dr G. H. Pethybridge received the following information from Monsieur Marchal while in correspondence with him concerning Dr Nattrass' isolation:

> Je crois de voir vous dire que le champignon que mon père et moi avons décrit sous le nom de *Fuckelia conspicua*, avait déjà été recontré par Potebnia qui le considère comme la forme conidienne de son *Phacidiella discolor*.

On commencing this further investigation the writer visited the apple plantation at Meldreth, where the pycnidial fungus was found originally, in order to obtain material from which fresh cultures could be made. Not only were pycnidia again found on

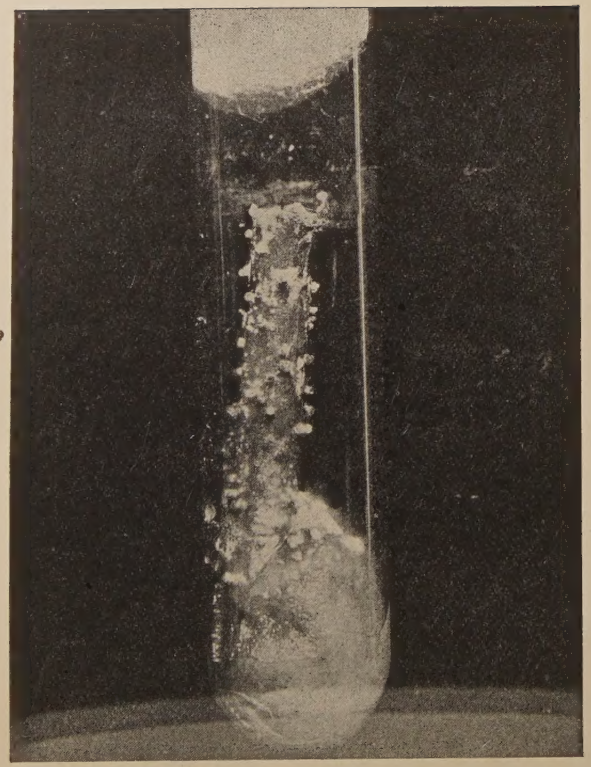

Fig. 1. Ascospore sub-culture on sterilised apple wood, five weeks old. Natural size.

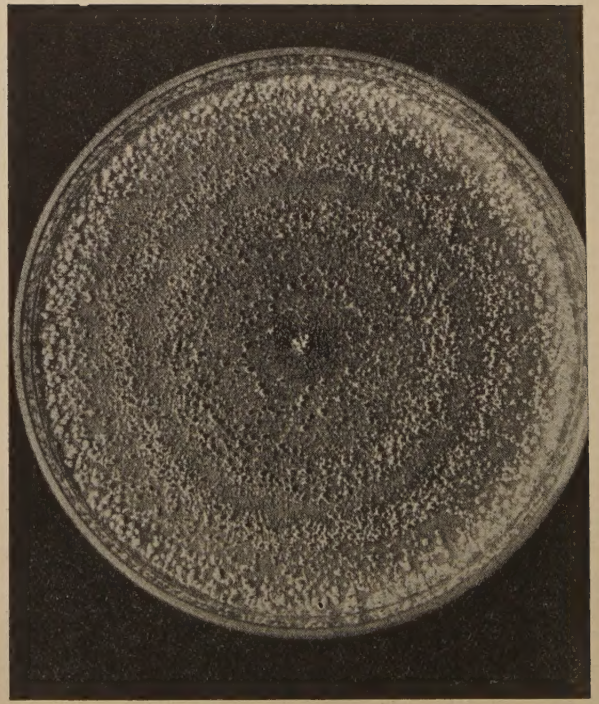

Fig. 2. Ascospore sub-culture on prune agar, two weeks old. Natural size.

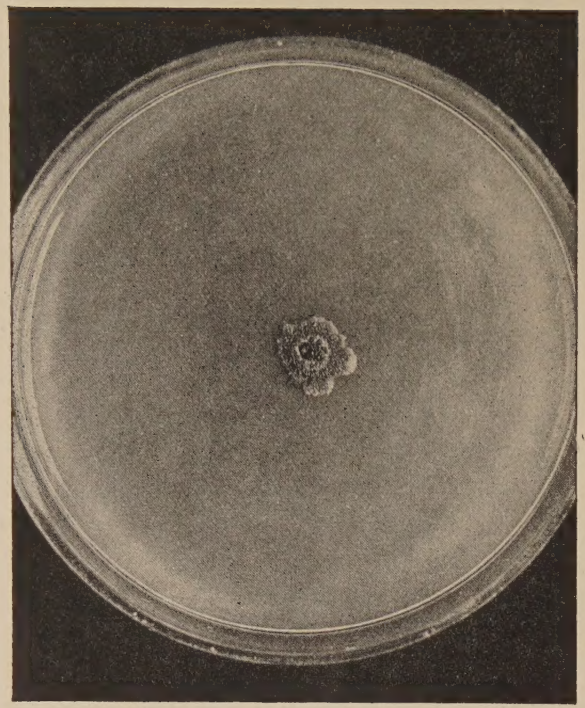

Fig. 3. Ascospore sub-culture on Dox's agar, two weeks old. Natural size.

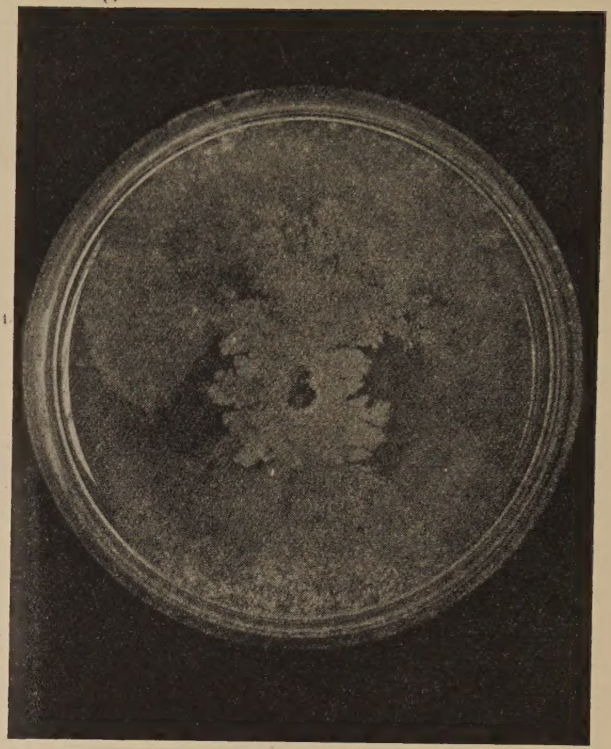

Fig. 4. Sub-culture on Dox's agar of naturally occurring pycnospores, two weeks old. Natural size.

cankered and dying branches of "Lord Derby" trees, but apothecia also, which agreed in every respect with Potebnia's description of *Ph. discolor.*

Cultures from single ascospores and from the junctions of diseased and healthy tissues were established, and the fungi thus isolated were grown on apple wood, Dox's agar and prune agar (used by Potebnia), together with *F. conspicua* and *"Py. furfuracea"* referred to above. The cultural behaviour of all these fungi was essentially the same, and was identical also with that of the fungi described by Southee and Brooks (1) and Potebnia (2).

Photographs of cultures on apple wood, prune agar and Dox's agar are appended (Figs. 1–4).

On apple wood and on prune agar, both in Petri dishes and in tubes, fertile pycnidia were formed abundantly. On Dox's agar in Petri dishes the fungus grew slowly and the mycelium budded profusely in a manner reminiscent of *Dematium pullulans*, as referred to by Potebnia (2); ultimately, however, from the budding mycelium there sometimes grew out hyphae of the type that form pycnidia, as shown in Fig. 4, in which very young pycnidia are just visible near the edge of the dish. On slants of Dox's medium in tubes pycnidial formation occurred more rapidly and more profusely than on plates. A comparison of Figs. 3 and 4 show that the different isolations have considerable differences both in rate and character of growth on Dox's medium in plates.

Potebnia (2) called attention to a peculiar feature of the mycelium on some culture media, in that the walls of certain hyphae become irregularly thickened towards the lumen. This feature was also exhibited by all the isolations now under consideration, being especially clear on prune agar. Potebnia states that Schulz's reagent stains the thickened hyphal walls a pale violet, but in my experience this colour reaction is inconstant.

In Potebnia's account the dimensions of the micro-pycnospores are given as $5 \times 2\mu$, as compared with $3–4 \times 1\mu$ recorded by Southee and Brooks. In some of the recent cultures these spores range from $3{\cdot}8–5 \times 1{\cdot}5–2\mu$. There is clearly considerable variation in the size of these spores. There are a few minor discrepancies between Potebnia's description of these small spores and the findings of the writer. Like Marchal (3), I have not yet got them to germinate, although Potebnia did. The latter states that the micro-pycnospores occur in nature and develop before the larger type of spore. The further experience of the writer agrees with the statement of Southee and Brooks that micro-pycnospores have not yet been found in nature in

England, and that their occurrence in culture is irregular: their formation does not invariably precede that of the macro-pycnospores.

The macro-pycnospores vary considerably in size in the different isolations. The following are some of the measurements recorded in recent work, in comparison with 10–12 × 8μ given by Potebnia, 9·5–12·5 × 6·7–8μ by Marchal (for *F. conspicua*), and 9–14 × 7–10μ by Southee and Brooks:

(*a*) From naturally-occurring pycnidia, March 1927—9–13 × 6–9μ.

(*b*) From culture, from an ascospore, on apple wood—7–12 × 7–9μ.

(*c*) From culture of R. M. Nattrass' isolation of *F. conspicua*, on apple wood—8–15 × 6·8–7·6μ.

(*d*) From culture of the Baarn *F. conspicua*, on apple wood—7·5–15 × 4·5–8μ.

(*e*) From culture of Miss Solberg's isolation of "*Py. furfuracea*," on apple wood—8–12 × 6–10μ.

There is also a certain diversity of shape in these spores: some taper to a point at one extremity, others are nearly spherical, but each strain has a predominant spore form.

The pycnidia vary somewhat in size when cultivated on the same medium: those of "*Py. furfuracea*" on prune agar plates are nearly twice as large as those of the ascospore isolation, although on apple wood they are practically the same.

In spite of the slight differences which have been indicated, all these forms undoubtedly belong to one and the same fungus, *Ph. discolor* (Mout. & Sacc.) Potebnia.

Further evidence of the essential identity of these forms was obtained upon inoculating apple fruits with them. Osterwalder (4) has described a black rot of apples caused by *Ph. discolor*, which is somewhat similar to that often due to *Sclerotinia fructigena*. Miss Solberg informs me that this black rot described by Osterwalder is fairly common in Norway on stored fruits of the variety "Signe Tillisch." Upon inoculating "Bramley Seedling" apples with the various forms described above a black rot was invariably produced. The skin of these fruits became black and the flesh was affected by a brownish-black rot. On apples kept in a moist atmosphere fertile pycnidia developed in great abundance, but with apple fruits kept in a dry atmosphere pycnidia either did not develop or remained rudimentary.

Miss Solberg, who kindly sent the culture of "*Py. furfuracea*" from a black-rotted apple in Norway, had associated this disease in the past with "*Py. furfuracea*" (Fr.) Rostr. on the ground of identity of symptoms and similarity of the pycnidia

with those of "*Py. furfuracea*" described by Rostrup (5) as the cause of a black rot of apples in Denmark. Miss Solberg has kindly sent me the following translation of Rostrup's account of the fungus:

> The fungus attacks apples, which thereby develop a blackened skin in which numerous, close-sitting, fine, flat warts soon appear. In moist air each of these fine points grows into a spherical pycnidium, 0·5–1 mm. across, which is closely beset with fine grey hairs and has a small, shining black, conical ostiole, so that the surface of the apple becomes quite rough. At first the pycnidia have a gelatinous-cartilaginous nature. When ripe the pycnidia become pointed, conical, and contain hyaline, elliptical spores, 8–10 × 4–5μ. The disease is destructive to apples, but appears so rarely that it cannot be said to be of practical importance up to the present.

Rostrup considered that his fungus was identical with *Periola furfuracea* Fr., described as occurring on rotting pears and apples. Rostrup recognised the peculiar nature of the pycnidia of this fungus, and was unable to assign it to its exact systematic position. There is one considerable difference between *Ph. discolor* and Rostrup's diagnosis of "*Py. furfuracea*," the pycnospores of the latter being only about half the width (8–10 × 4–5μ) of the former. In view, however, of the range of spore size of the various strains of *Ph. discolor* examined, and especially in view of the *average* width of the spores of the Baarn *F. conspicua* being only 5·4μ, perhaps the discrepancy is not serious. Although it has not been possible to examine Rostrup's type specimen of "*Py. furfuracea*," the writer is of the opinion that it is probably identical with the pycnidial stage of *Ph. discolor*. Certainly the fungus sent from Norway belongs to this Ascomycete.

Von Hoehnel (6) states that *Pseudophacidium atroviolaceum* v. H. is the same as *Ph. discolor*. He considers the latter to be the best name for the fungus, but places it in the Stictidaceae instead of the Pseudophacidiaceae as did Potebnia. As regards the pycnidial stage von Hoehnel considers that *Phacidiopycnis* Potebnia = *Discula* Sacc., and that *Phacidiopycnis Malorum* Potebn. = *Cytispora Pyri* Fuck., which he re-names *Discula Pyri* (Fuck.) v. H. On the other hand, Miss E. M. Wakefield, who has examined a Vienna specimen of *Cytispora Pyri* Fuck. in the Kew Herbarium, kindly allows me to state that, in her opinion, this fungus cannot possibly be identical with the one under consideration in this paper as its spores measure 30 × 12μ (20 × 10μ in Fuckel's description). For the present the best name for the pycnidial stage of *Phacidiella discolor* is ~~*Pseudo-pycnis Malorum*~~ Potebnia.

The writer is indebted to Mr A. K. Briant and Mr E. B. Martyn for much help in the observational and cultural work on this fungus. He would like also to record his grateful thanks

to Miss E. M. Wakefield, Miss L. Solberg, Dr G. H. Pethybridge, Dr R. M. Nattrass and Mr W. C. Moore for cultures and for assistance with literature.

SUMMARY.

The occurrence of *Phacidiella discolor* (Mout. & Sacc.) Potebnia in England is recorded, associated with a die-back and canker of apple trees, as described in a recent paper on the pycnidial stage of this fungus by Southee and Brooks (1). The fungus also causes a black rot of apples in storage.

Cultural work has shown that *F. conspicua* Marchal, and probably also "*Pyrenochaeta furfuracea*" (Fr.) Rostr., is identical with the pycnidial stage of *Ph. discolor*.

Further information is given about the growth of the fungus on culture media.

The synonomy of the fungus is considered.

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